MICROCOPY RESOLUTION TEST CHART
DS-1963-A

DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

AD-A188 144

DTIC
ELECTE
NOV 2 3 1987
D

1b. RESTRICTIVE MARKINGS

3. DISTRIBUTION / AVAILABILITY OF REPORT
Approved for public release; distribution is unlimited.

2b. DECLASSIFICATION / DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

R-110

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
USAETL	CEETL-LO	

6c. ADDRESS (City, State, and ZIP Code)	7b. ADDRESS (City, State, and ZIP Code)
Fort Belvoir, VA 22060-5546	

8a. NAME OF FUNDING / SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS			
	PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

BATTLEFIELD ENVIRONMENTAL EFFECTS SOFTWARE (BEES) AN OVERVIEW

12. PERSONAL AUTHOR(S)
Lt ROBERT J. GOLDEN, JR.

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
TECHNICAL	FROM _____ TO _____	28 SEP 87	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	software programs
			compatible computer systems

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The Battlefield Environmental Effects Software (BEES) is a series of interactive computer programs. BEES provides command and staff elements with climatic data and informaiton concerning the effects of the environment upon military operations, equipment, and personnel. BEES is designed to aid the long term planner and war-gamer as well as the terrain analyst.

This briefing will discuss the currently available and planned software programs, and compatible computer systems.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
F. DARLENE SEYLER	202-355-2647	CEETL-LO

DD Form 1473, JUN 86   Previous editions are obsolete.

BATTLEFIELD ENVIRONMENTAL EFFECTS SOFTWARE: AN OVERVIEW

LT Robert J. Golden Jr.
U.S. Army Engineer Topographic Laboratories

CDR/DIR, USAETL
ATTN: CEETL-GL-AE
Fort Belvoir, VA 22060-5546

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BEES FUNCTIONS

We have grouped BEES programs into five functional areas: Climatologies, Operations, Almanac, Engineering, and Utilities. We have designed BEES programs to be self-explanatory and easy to use. Menus drive BEES programs. Most programs prompt the user for inputs, then calculate the results. One functional area, Climatologies, accesses a set of internal climatic databases.   I will briefly discuss each BEES function.

1. Climatologies

Currently, BEES contains climatological information for: West Germany, North and South Korea, the Middle East/ Southwest Asia, Central America, and the United States. BEES provides four types of climatologies:

   a. Historic Climate Statistics displays monthly means, extremes, and frequency data for 37 climatic parameters such as temperature, precipitation, snowfall, windspeed, ceilings, and visibilities.

   b. Density Altitude Climatology displays a range of monthly density altitude values. The values are calculated using historic temperature and relative humidity values, and the station pressure.

   c. Paradrop Climatology displays frequencies of occurrence of conditions favorable for each of four categories of

paradrop operations. Values are for selected hours, by month.

d. __Surface Winds Climatology__ displays average windspeeds and prevailing wind directions for selected hours, by month.

2. Operations

These functions contain programs which describe how the environment can affect military personnel, equipment and operations.

a. __Density Altitude/Helicopter Load__ calculates a density altitude value from user inputs of temperature, relative humidity or dewpoint, and elevation or barometric pressure. The program then applies this value to calculate a load carrying capacity for any of 15 friendly helicopters. We have recently added data for four threat helicopters.

b. __Fixed-Wing Aircraft Capabilities__ computes the length of runway needed, load capability, and provides groundroll speed checks, and obstacle clearance distances for 12 propeller-driven aircraft.

c. __Environmental Thresholds and Impacts__ enables the determination of the effects of climate/weather and terrain conditions in 11 different subject categories such as aviation, vehicles, weapons, and personnel.

d. __Cross Country Mobility__ calculates the maximum off-road speeds for 16 friendly and two threat vehicles according to the Defense Mapping Agency's cross country mobility model.

3. Almanac

BEES almanac programs compute sunrise/sunset, and moonrise/ moonset times for locations between 60 degrees North and 60 degrees South latitude. The sun program also computes beginning and ending times for the three categories of twilight-civil, nautical, and astronomical. The moon program also calculates the percentage of the moon's face which is illuminated.

4. Engineering

BEES has based its engineering functions on computer models developed by the US Army Construction Engineering Research Laboratory (USACERL). The programs automate manual calculations from FM5-34. They calculate the manpower, time, materials, and logistics needed for the following engineering functions:

a. <u>Standard Pattern Minefields</u> calculates the quantities of mines required to obtain the mine densities desired. It also calculates the number of lettered strips and irregular outer edge (IOE) clusters required.

b. <u>Road craters</u> performs all calculations to emplace hasty, deliberate, and relieved-face road craters.

c. <u>Wire Obstacles</u> performs all calculations to emplace the following 6 types of wire obstacles: double-apron, 4+2 pace; double-apron, 6+3 pace; high wire; low wire, 4+2 pace; 4-strand fence, triple standard concertina.

d. <u>Demolitions</u> performs all calculations to cut timber, cut steel, and breach walls.

5. <u>Utilities</u>

BEES utility functions automate certain reference tables and manual calculations which are widely used in the field.

a. <u>Psychrometric Calculations</u> calculates dew points and relative humidity values from wet and dry bulb temperature inputs.

b. <u>Unit Conversions</u> converts a value into other relevant English and metric units, for the following measurement subjects: area, length, mass, precipitation rates, pressure, temperature, velocity, and volume.

c. <u>Standard Atmosphere</u> automates the standard atmospheric curve which relates elevation to air pressure.

d. <u>Altimeter Setting</u> aids a pilot in making the calculations necessary to set his altimeter.

e. <u>Windchill</u> calculates the combined effect of cold temperatures and wind.

f. <u>Temperature Humidity Index</u> estimates the percentage of personnel who will feel discomfort based on the temperature and dewpoint values entered.

DEVELOPMENT OF BEES AND CURRENT INITIATIVES

Battlefield Environmental Effects Software (BEES) has been continuously updated, revised, and expanded since 1982. This section will briefly summarize past, present and future BEES development.

The original BEES programs were developed on a Hewlett-Packard (HP)-85 and HP-86 desktop computers. BEES personnel demonstrated software to Army field units and staff sections at exercises such as Gallant Knight in 1983, 1984 and 1986, and Bold Venture 86. We gained valuable feedback from commanders, staff, and terrain analysts.

BEES support to the field Army has evolved continually. Originally, units requested climatic data and other BEES products by telephonic and written request to the section here at USAETL. BEES personnel delivered completed requests by mail. USAETL continues to fill field requests for climatic data. However, we are striving to make BEES software compatible with some of the widely used Army computer systems.

The Army's MICROFIX tactical computer fielded BEES software to the Army. Army Engineer Terrain Teams at division, corps and theater levels use MICROFIX computers equipped with topographic software to analyze weather, climate and terrain. Three programs appeared on the MICROFIX software version 2.0, as a distinctive software package under the BEES heading. Version 2.1 of the MICROFIX Topographic Workstation software increased its BEES portion to 14 programs. The MICROFIX Topographic Workstation software, Version 2.2, contains only a small, modified subset of BEES. Abbreviated BEES climatic databases, and several other programs appear as an integral part of the Weather/Environment section.

USAETL personnel are now translating the complete BEES code to make it compatible with a VAX computer running the VMS operating system. Comments and feedback received from terrain analysts and other field users have helped us to refine and enhance these VAX/VMS-based BEES programs. We are also collecting and computerizing additional climatic databases. Presently, we are working on North Africa and South America. USAETL will demonstrate portions of this software during future AirLand Battlefield Environment (ALBE) demonstrations. The Army will field BEES on the Digital Topographic Support System (DTSS).

Due to the large number of IBM-compatible ZENITH personal computer (PC) systems in the field, we are considering developing a BEES software package for this system. To express your interest in, or requirement for, a Zenith/PC-based version of BEES, please send a letter to the following address:

Commander/Director
U.S. Army Engineer Topographic Laboratories (USAETL)
ATTN: CEETL-GL-AE (BEES)
Fort Belvoir, VA 22060-5546

Telephone: AV:345-2848   (202) 355-2848
Personnel: Robin Carroll, Paul Krause, LT Bob Golden

We also remind you that Engineer Topographic Labs (ETL), has
a vast collection of hard copy climate data as well as many
environmental effects reports. Send requests for this
information to the above address.

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